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# Lighting for Textile Production

By H. HEWITT, *(Fellow)*


## Summary

Visual conditions in the group of industries concerned with textile manufacture have been influenced considerably by developments in lamps, lighting equipment and lighting methods in post-war years. An attempt is made to assess the value of these changes to both management and workers.

Particular reference is made to the technical and economic factors involved in the use of fluorescent lighting, and an examination is made of the equipment available to meet the conditions found in the textile industries. Re-equipment and new building have created opportunities for the adoption of new lighting techniques and some installations involving novel methods of lay-out and control are reviewed.

Reference is also made to the latest applications of light sources for inspection and quality control.


## (1) Introduction

During the last few years several detailed studies [1][2][3][4] have been made of the lighting requirements of the textile industries, and another similar study would not be timely. However, after some years of post-war lighting, during which there has been a new appreciation of the benefits of good illumination in industry and a rapidly extending use of the tubular fluorescent lamp, it may well be useful to survey the position and to assess the work of the lighting engineer.

This paper, therefore, attempts a critical appraisal of some aspects of lighting for textile production, and reference will be made to lighting problems and lighting installations in some of the industries which deal with natural fibres and also in the newer industries which are concerned with artificial fibres.

The textile industries are an important part of the industrial structure of this country. In 1948 the cotton industry alone employed about 300,000 workers, though this may now have decreased because of the recent recession in trade. The textile industries are also important because a significant proportion of their products is exported.

These industries are not only of considerable magnitude and importance but most of them have a relatively long history. This means that many premises in which textile products are manufactured are old in years and more would undoubtedly have been reconstructed but for the restrictions on building during post-war years. These older mills are not particularly attractive to workers but many managements have seen the advantage to be gained by providing better working conditions, and this has frequently meant an improvement in lighting standards.

Further improvements will be made possible by the replacement of capital equipment in the mills, involving the re-spacing of industrial plant. Moreover, long-term forecasts would suggest that the textile industries can only regain their former status if plant is operated for longer hours. An international survey of cotton looms shows that the average hours worked by the cotton weaving industry in Great Britain amounted to 32.66 per week, whilst the average in the United States was 106.8 per week. There are many advocates of multiple shift working in the British textile industries, but such developments have been limited, chiefly because of a shortage of labour. Should multiple shift working increase, it would have a marked effect upon artificial lighting standards.

The author was formerly with The North Western Electricity Board and is now with Thorn Electrical Industries, Ltd. The manuscript of this paper was first received on September 3, 1953, and in final form on October 7, 1953. The paper was presented at a meeting of the Society held in London on December 8, 1953.

## (2) Textile Premises

One of the chief difficulties encountered in the lighting of textile units is the restricted mounting height available compared with that common in many other industries. Weaving, particularly in the cotton industry, is usually carried out in single-storey buildings in which it may be impossible to mount light sources at a height greater than 12 or 13 ft. Usually the spinning mill is a multi-storey building in which the preparation processes are carried out on the ground floor and the spinning processes on the upper floors. While the exterior appearance of many older mills is rather grim, modern textile factories often have an attractive and impressive appearance, as illustrated by the mill shown in Fig. 1. Even in such a mill, however, the mounting height available is not great and it is not often possible to consider the use of high-wattage lamps for general lighting purposes. Exceptions are the chemical departments of the factories concerned with synthetic fibres where sheds over 60 ft. in height have been illuminated by blended light from mercury vapour and filament lamps. In general, however, we are concerned chiefly with the lighting of interiors in which the mounting height is restricted, the problem being particularly acute in weaving sheds, some of which are of considerable area. A survey made in 1948 in the cotton industry showed that of 838 weaving firms, the majority operated between 200 and 600 looms, the most usual size of weaving shed housing between 350 and 450 looms. In the earlier days of the industry these looms were closely spaced but in more recent years a great deal of re-spacing has been done and some concerns have taken this opportunity of modernising the whole plant. By providing individual drive to

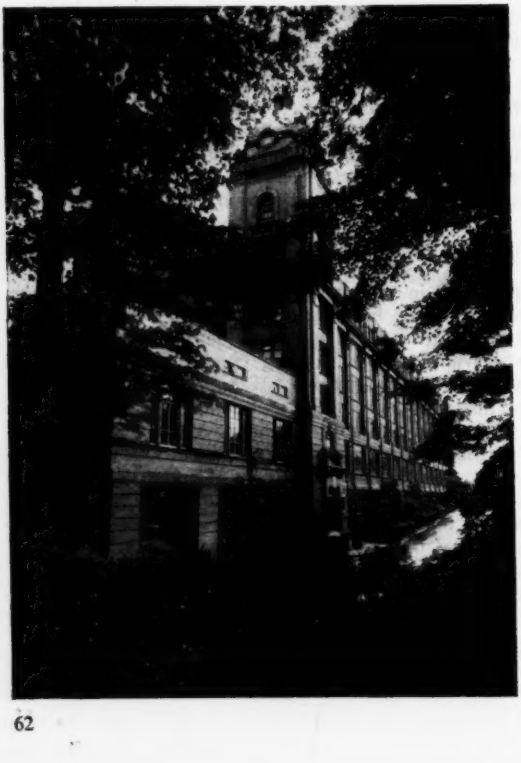

*Fig. 1. Exterior of a Lancashire cotton spinning mill.*

*Fig. 2. Mule spinner at work in the cotton industry.*

each loom it is possible to dispense with overhead line-shafting and belts, and the lighting engineer is given more scope for effective design.

Amongst the limited amount of new building that has been possible in recent years, there are several interesting experiments in the use of pre-stressed concrete roofs to avoid the necessity for pillars, whilst some concerns are also dispensing with windows and relying upon artificial lighting throughout all working hours.

The appreciation of the value of better working conditions has also led to more attention being paid to the decoration of industrial interiors and the use of colour, not only to provide visual comfort but also as an aid to easy identification of certain parts of machinery.

### (3) Visual Tasks

There are many routine operations in the textile industries which do not call for any special degree of visual acuity. Moreover, operatives are often concerned with yarn or cloth of white or near-white colours and this is usually an aid to quick identification. There are, however, certain aspects of textile production which make it necessary to provide exceptionally good seeing conditions, and for one or two specialised operations the use of work glasses can be justified to assist the operative. An example of this is revealed in a report[5] on a visual welfare scheme carried out in a Scottish factory, in which bar-fillers must see quickly detail much smaller than 1/32-in. A good deal of experimental work has been carried out at this factory, and the interests of both management and workers were shown to be best served by providing a local illumination of 70 lm./ft.$^2$ by means of fluorescent lamps and equipping the operatives with work glasses.

This is, however, an exceptional operation, but it must be remembered that in textile operations bobbins may be revolving at high speeds, that quality is all-important to the industry, and that sometimes workers must observe small details at long range. Fig. 2 shows a Lancashire spinner working at a mule spinning frame in the repairing of a broken end. During the normal operation of the mule-frame the operative must observe the yarn over long distances, though the quick identification of a dropped end is facilitated by brightness contrast, the yarn being seen against the comparative gloom beneath the frame.

Weaving is the basic production process in the textile industries, and requires the

highest level of illumination. Much good work has been done in the relighting of weaving sheds to assist the weaver in seeing faults and quickly repairing them. Until quite recent years it would not have been unusual to find weavers using hand torches to repair faults, and the author was recently told by one weaver that she used two batteries a week for this purpose before modern lighting was installed.

A further factor which must be borne in mind is that some operations require good illumination on the vertical plane. Many machines are closely spaced at each side of long alleys, and the operative must observe rows of revolving bobbins at heights varying from 4 ft. to 1 ft. above the floor. Such an operation requires carefully planned lighting to ensure safe and efficient working.

## (4) Illumination Requirements

### (4.1) Levels of Illumination

Amongst the many attempts that have been made to decide the levels of illumination required for various industrial operations were a number of experiments carried out in the textile industries, and there is no doubt that these pilot schemes can serve a useful purpose. Their results, however, cannot be considered without some attention being given to variable factors which affect the whole problem, for vision is a subjective function and the efforts of the lighting engineer to assist vision cannot be fully assessed by taking objective measurements. In other words, lighting is not a subject which lends itself to strict mathematical treatment. As Ward Harrison has pointed out, it is one of the fields in which considered judgment is still of great value.

Fortunately, sufficient relighting has been done in the textile industries since 1940 to allow not only the collation of facts but also the assessment of opinion, and it is possible to decide whether, in the view of management and workers, the illumination levels now being provided in textile mills are reasonable and economic.

The minimum illumination of 6 lm./ft.$^2$ required by the Factories (Standards of Lighting) Regulations, 1941, is without prejudice to the provision of higher levels where required for special operations, but it is significant that a Joint Advisory Committee on the cotton industry, reporting in 1947(6), proposed that the minimum level of 6 lm./ft.$^2$ was sufficient throughout spinning mills, and suggested higher levels only for weaving operations. The committee proposed that the illumination should be "somewhat higher" when weaving light materials, and "considerably higher" when weaving darker materials. At the same time the committee suggested that special consideration should be given to the lighting at the back of the looms.

This would seem to suggest that at that date the industry had decided to turn its back upon the really low levels of illumination, often 2 lm./ft.$^2$ or less, which had obtained in many textile mills in previous generations. It is significant, however, that the committee also produced a minority report suggesting that the preparation processes in the cotton industry could be adequately lighted at a level of about 3/4½ lm./ft.$^2$, that spinning and the weaving of light materials required 6 lm./ft.$^2$, and that the weaving of dark materials could be carried on quite satisfactorily with an illumination of not more than 10 lm./ft.$^2$.

A Joint Advisory Committee which reported(7) on lighting in the wool industry in 1949 suggested that the illumination should be at least 10 lm./ft.$^2$ for all operations except burling, mending and perching, which require at least 20 lm./ft.$^2$.

These very moderate suggestions were made in recent years by committees representing both sides of the industry. The I.E.S. Lighting Code proposes illumination values which are higher over the whole range of textile operations, and it is gratifying, therefore, that the values suggested in the Code are being widely adopted and are recognised as good textile lighting practice. In fact, it appears that arguments are likely to arise only on two points. Firstly, it has been advocated in some quarters that the preparation processes in, say, the cotton industry, require an illumination as

high as 10/15 lm./ft.$^2$. In view of the nature of the visual tasks involved in these processes, this contention is difficult to justify. If a lighting scheme designed to give 8/10 1m./ft.$^2$ in service is planned along proper lines and uses correct equipment, visual conditions should be acceptable. Secondly, there may be doubts about the provision of higher and higher levels of illumination for weaving processes, for whilst it may be easy to justify increasing the illumination for a certain process from 10 1m./ft.$^2$ to 20 1m./ft.$^2$, it is far more difficult to justify a further doubling to 40 1m./ft.$^2$. Further doubts on the value of very high levels of illumination for weaving processes arise when the limited mounting height generally available in these sheds is remembered, for the difficulties involved in providing these high levels of illumination in such circumstances have already been referred to. Illumination levels in American industry are generally greater than those in this country, but it would appear that the heights of their textile buildings are usually greater, and so the problem of the control of glare may not be so acute.

**(4.2) Quality of Illumination**

Many complicated machines are used in the textile industries and often the operative must "see into" the machine to ensure proper working. This suggests that a high degree of diffusion is required from the general lighting scheme. This can be achieved either by using a large number of small wattage units (which may be costly), or by using extended light sources of low brightness, e.g., the tubular fluorescent lamp. In considering the advantages of fluorescent lighting for the textile industries it is doubtful if this aspect has been sufficiently emphasised.

In some industries vision is hindered by reflected glare from components or polished parts of machines. This is a difficulty which is not often encountered in textile work, though it may occasionally be caused by light reflected from the material itself, e.g., from considerable masses of white cotton sliver when seen against a dark background under a high level of illumination. This is a problem that is not easily solved, though a partial solution lies in the careful choice of brightness contrasts which can sometimes be achieved by painting machines, etc., in appropriate colours.

The whole question of the choice of colours in the decoration of the interiors of textile buildings and in the treatment of textile plant has received, as yet, little attention. We are approaching the time, however, when reasonable quantities of light will have been provided in most buildings and further improvements will be in the direction of better quality of lighting. In that event it is difficult to dissociate the provision of light from the surfaces which reflect it. The valuable work done in the field of brightness engineering has already emphasised this factor, but there must remain in the minds of many lighting engineers, particularly when faced with the relighting of old textile mills, a doubt whether this subject is capable of mathematical treatment. Here again, considered judgment may be a better servant than formulae and slide rules.

## (5) Lighting Equipment

**(5.1) Lamps**

After the passing of gas lighting in the textile industries, the incandescent electric lamp was for many years the accepted light source. Early experiments with the mercury discharge lamp showed that this was not generally acceptable owing to poor colour rendering, and it was not until the development of the hot cathode fluorescent lamp that the incandescent lamp faced serious competition.

There are some large textile installations employing high voltage cold cathode lamps, but these installations are relatively few in number. When compared with the hot cathode lamp, the cold cathode lamp presents two main advantages, namely, longer life and easier starting. In recent years, however, the average rated life of the hot cathode lamp has been increased, and as circuits for the instantaneous starting of

this type of lamp have also been developed it is not likely that there will be any great expansion in the use of cold cathode lamps for industrial lighting.

When compared with the incandescent lamp, the hot cathode fluorescent lamp presents the advantages of high efficiency, long life, low brightness and a better control of colour. The last of these advantages is not of special interest in general industrial lighting, though colour-matching in the textile industry can be assisted by fluorescent equipment. Low brightness is a definite contribution to improved quality in lighting by reason of the reduction of both shadow and glare, and this feature of the fluorescent lamp makes it very acceptable in these industries where machinery is both varied and complicated. The first two advantages, i.e., high efficiency and long life, would suggest that the fluorescent lamp is more economical in use than the incandescent lamp, but it must be borne in mind that a greater capital outlay is required for fluorescent lighting equipment and also that the installation may cost more to maintain than an incandescent installation.

A full consideration of the economics of industrial lighting is made difficult not only by these conflicting factors but also by the complications involved in the energy charges for industrial supplies and by the lack of real evidence on maintenance costs. Attempts have been made to secure factual information from textile concerns but, whilst useful data is available, the evidence is not sufficiently comprehensive to allow definite conclusions to be drawn for any particular lighting installation. But the lack of evidence, whilst preventing a categoric answer, does not invalidate the question and it is important that all aspects of the problem should be appreciated.

The total cost of any lighting installation comprises four elements—capital cost, energy costs, lamp replacement cost and maintenance costs, and whilst these four elements are common to all industrial lighting, some of the requirements of the textile industry call for special comment.

(5.1.1) *Capital Costs*

It has already been pointed out that fluorescent lighting equipment is more expensive than incandescent lamps and fittings, but it may be possible in some installations to justify the additional expenditure solely because of the improved quality of lighting, e.g., in a weaving shed manufacturing fabrics of dark colours, where good visual conditions are essential for speedy and accurate working and where the cost of spoilage would be high.

(5.1.2) *Energy Costs*

Most textile concerns are charged on a 2-part tariff and it is often difficult to determine the total cost of the energy used for lighting purposes only. It is necessary to know not only the fixed charge and the running charge (with adjustment for the cost of coal), but also the extent to which the lighting load contributes to the annual maximum demand or average monthly maximum demand. The energy costs also depend on whether the mill uses electricity for lighting only, or whether electricity is used also for motive power and other purposes. Furthermore, the overall cost per unit for a mill working day-shift only will obviously be different from that of a mill working multiple-shifts.

(5.1.3) *Lamp Replacement Costs*

The long life of the fluorescent lamp is an undoubted advantage for industrial lighting, particularly where, as in the textile industries, lamps do not need to be switched in and out frequently. Evidence available from the textile industry shows that the claims made regarding the average useful life of fluorescent lamps are well founded.

(5.1.4) *Maintenance Costs*

The necessity for starting equipment and larger fittings for fluorescent lamps would suggest that maintenance costs for this type of installation are likely to be higher

than those for an incandescent installation. In the textile industries, however, there are varied maintenance requirements. In the cotton and wool industries, for instance, there is a good deal of "fly" in the atmosphere and this, together with the essential humidity, makes it necessary that fittings should be cleaned at frequent intervals, and this cleaning may take some considerable time and energy. In the industries concerned with artificial fibres, however, the problem is not so great and fittings which are brushed down occasionally may only require real cleaning once every year. The continued expansion in the use of devices for instantaneous starting of fluorescent lamps is very welcome, as the diagnosis of starter-switch troubles in textile mills involves a good deal of labour and also tends to interfere with production.

(5.1.5) *Summary*

From the above brief review of the various elements which make up lighting costs, it will be evident that a considerable amount of reliable and detailed information would be necessary to allow a direct comparison to be made between incandescent and fluorescent lighting for any textile factory. In the absence of such comprehensive data it is possible only to consider the information that is available in the light of the accumulated experience of textile and lighting engineers, and this seems to suggest that the following statements are true :—

When illumination levels of more than 10 lm./ft.$^2$ are required in textile factories, fluorescent lamps are almost certain to provide better results than incandescent lamps, and their high luminous efficiency and longer life tend to make their use more economic.

Even when providing illumination levels below 10 lm./ft.$^2$, fluorescent lighting may still be preferable because :—

(a) The operations, whilst not requiring a high level of illumination, require lighting of good quality;

(b) The electrical installation is fully loaded, leaving no scope for the improvement of lighting by an increase in the loading of incandescent lamps;

(c) The factory is engaged on multiple shifts and the longer hours of use justify an increased expenditure for lighting equipment.

The earlier prejudices against fluorescent lighting in the textile industries on the grounds of stroboscopic flicker, poor colour-rendering, etc., appear to have been overcome.

If the improvement in the useful life of fluorescent lamps and the elimination of expendable starting devices are followed by a reduction in the first cost of fluorescent equipment, this type of lighting could supersede incandescent lighting in the textile industries within the next decade.

**(5.2) Fittings**

Modern textile lighting has not made severe demands on the fittings designer, though the wider use of fluorescent lighting, common also to many other industries, has led to developments in fluorescent equipment generally. In the textile industries there are some unusual atmospheric conditions which require specially designed fittings, e.g., the vapour-proof fittings which are necessary in dyehouses, etc., and the moisture-proof fittings required by the severe conditions in wet spinning in the flax industry. On the whole, however, orthodox industrial fittings find many applications in these industries, and where incandescent lamps are used the vitreous enamelled standard dispersive reflector (with cover-glass when required) is very effective for general lighting purposes.

The use of a vitreous enamel finish on reflectors for fluorescent lamps is not so common, partly because of the additional cost and partly because of the difficulty involved in applying vitreous enamelling to so large an area. It must be recorded, how-

ever, that stove enamel finishes have been considerably improved since the early days of fluorescent lighting, and modern reflectors do not deteriorate rapidly. Nevertheless, it is a matter which still requires attention, particularly as a relatively high humidity is very necessary for certain textile operations, and this makes a greater demand on the performance of lighting fittings. One approach to the problem has been the use of plastic enamel finishes. Fig. 3 shows a large installation of twin fluorescent lamp fittings arranged in continuous rows, giving an illumination of 45 to 50 lm./ft.$^2$ in a rayon weaving shed. Suspended along the centre aisle will be seen a row of humidifiers which spray moisture in close proximity to the lighting fittings. Because of these arduous conditions it was decided to use fittings with a plastic enamel finish, and after five years in service these fittings showed no sign of corrosion. The finish, whilst being cheaper than a vitreous enamel finish, is reasonably flexible and can be applied to any shape without being liable to crack or embrittle. Moreover, it is claimed that such fittings will withstand acid-laden or alkali-laden atmospheres.

The demand for higher levels of illumination has necessitated layouts such as the one just referred to, in which continuous rows of fluorescent lamps are employed. This has led to the design of "trunking systems" which accommodate not only the auxiliary gear and wiring but also cables for telephone circuits and other services. An installation of this type in a Lancashire weaving shed producing rayon cloth is shown in Fig. 4. As in all the textile industries, it is important that the weaver should be given virtually shadow-free illumination and also that the lighting in the beam alley (i.e., at the loom back) should be equal to the lighting in the weaver's alley. This has been achieved by using ten continuous lines of twin-tube fluorescent lighting on the trunking system, the lines running at right angles to the loom width and each line being positioned over the centre of the loom. The average illumination in service is about 40 lm./ft.$^2$. Not only has the result been acceptable to both management and workers but considerable time was saved in installing the trunking system compared with the time required for installing individual fittings.

Another advantage of certain trunking systems is that there is room for manoeuvre in choosing suspension points and this is a considerable asset in many factories. It may be asked whether, as the system is proving successful with 5 ft. 80-watt lamps, it could not be equally successful, and perhaps a little cheaper, with 8 ft. 125-watt lamps. One difficulty in the use of larger lamps is the physical task of lamp replacement in

*Fig. 3. Modern lighting in a weaving shed.*

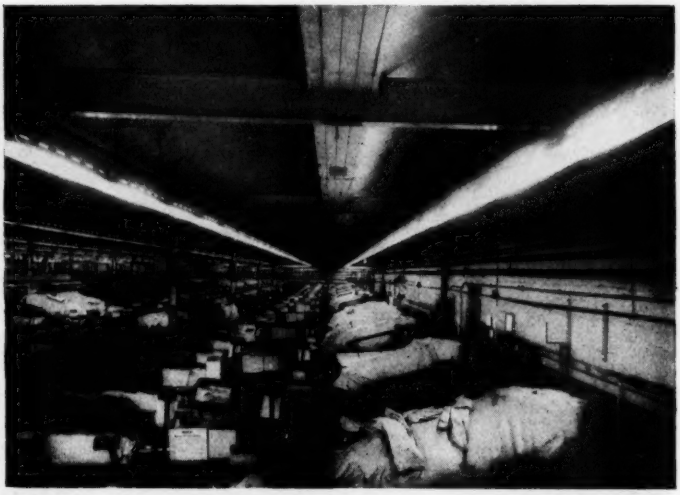

*Fig. 4. Continuous troughing for the lighting of looms.*

crowded industrial buildings; another is that the auxiliary gear for these 8 ft. lamps may be too bulky to be easily housed in a trunking system.

Whilst the development of fittings which are efficient and easily installed is very welcome, textile engineers are perhaps even more concerned that fittings should be capable of easy maintenance. Reference has already been made to the humidity necessary for certain textile operations and this, together with the presence of "fly" in certain parts of textile mills, means that lamps and reflectors can soon be coated with a filmy layer, sometimes greasy, which seriously reduces the efficiency of the fitting. It is important, therefore, that all reflecting surfaces should be capable of being cleaned quickly; moreover, these surfaces should be either easily accessible or easily removed for maintenance purposes.

## (6) Layout and Control

### (6.1) General

A general review of recent re-lighting of textile premises shows that a preponderant feature of these new installations is that of general lighting of a "semi-localised" character. There are three reasons for this. Firstly, many of the operations primarily require illumination over long, narrow areas. Secondly, a symmetrical lighting scheme would inevitably result in many lighting points being positioned above machines, where accidental lamp breakage might result in serious damage and loss of production; moreover, lamps situated over alleys are more easily maintained. Thirdly, in many of the older mills, shafting, pulleys, belts and other overhead obstructions make it difficult to plan a symmetrical scheme even if it were otherwise desirable. It is, therefore, common to see textile areas lighted to levels of between 8 and 15 lm./ft.$^2$ by means of lighting points disposed fairly regularly but positioned to avoid both overhead obstructions and the machines themselves.

With the demand for higher illumination, however, the planning tends more and more towards a regular layout, and when these higher levels of illumination must be provided from a restricted mounting height it becomes impossible to avoid positioning some of the lighting points above the machines. Examples of this are to be found in a number of weaving sheds.

*Fig. 5. Weaving shed of modern construction; view across shed.*

### (6.2) Lighting for Weaving

Reference has already been made to the illumination values recommended for the weaving process; these values may vary from 20 to 40 lm./ft.$^2$ according to the colours and counts involved. It was also shown that, partly because of the low buildings, the tubular fluorescent lamp has become a useful light source in weaving sheds.

Unfortunately in many of the older sheds there is a maze of overhead obstructions, and when a shed houses jacquard looms, each of which carries a large and complicated superstructure, the problem facing the lighting engineer is most difficult. Even in a shed containing plain looms, however, the overhead obstructions are considerable unless each loom is individually powered, and in 1948 it was estimated that only some 12 per cent. of the 300,000 looms in the cotton industry were individually driven. Where these more favourable circumstances obtain, however, it is possible to adopt general lighting schemes, as in the weaving shed shown in Fig. 4. It is not easy to predict what alterations in plant layout might be necessitated by future re-equipment, but a lighting scheme such as the one illustrated in Fig. 4 would be satisfactory for almost any combination of plain looms except one in which the lamps lie parallel to the loom width, when there would not only be shadows cast by the sleys but also a greater possibility of glare when looking along the weaver's alley.

### (6.3) Use of Architectural Features

A new development in the lighting of weaving sheds makes use of the North light roof by using the south side of each span as a mounting position for batten-type fluorescent fittings. Some of these fittings employ bare lamps, but at the mounting height available at this position in the traditional weaving shed even the low brightness fluorescent lamps may prove to be sources of glare. In more modern structures, however, the idea can meet with greater success. Figs. 5 and 6 show a weaving-shed in the Lancashire cotton industry which has been built during the last few years. The shed is a pillarless structure housing nearly 600 automatic looms, all individually driven. Double day-shift working in this shed means that the plant is running for 16 hours per day, and the artificial lighting is photo-electrically controlled to give an

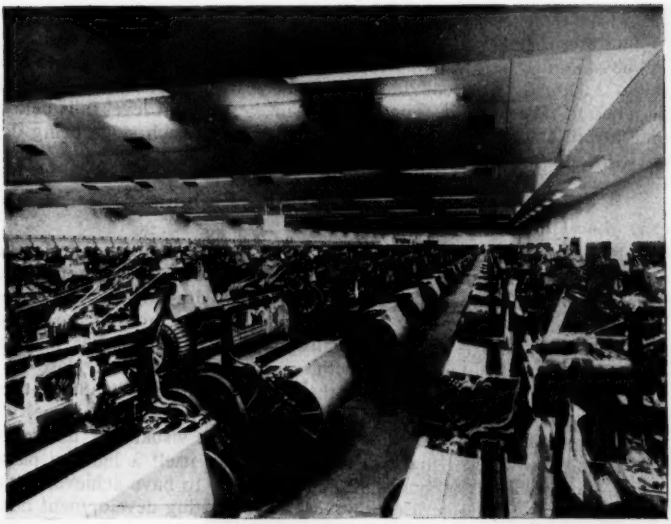

*Fig. 6. Weaving shed of modern construction; view along shed.*

illumination of at least 20 to 25 lm./ft.$^2$. Fig. 5 shows how the double lamp 80-watt fittings have been mounted. Row A (the "gutter" row) consists of trough fittings, whilst rows B and C, mounted at different heights on the south side of each roof span, are batten fittings with bare lamps. The view shown is across the rows of looms. Fig. 6 shows a view of the whole shed looking along the weaver's alley, and it will be seen that in the more distant part of the shed only the gutter rows of trough fittings can be seen, the roof structure itself acting as an effective "cut-off" for the batten fittings. This installation is considered to be an excellent example of the use that can be made of structural features when planning industrial lighting schemes.

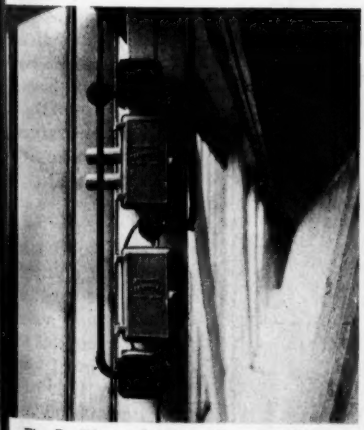

*Fig. 7. Photo-electric cells controlling weaving shed lighting.*

**(6.4) Photo-Electric Control**

Reference was made to the photo-electric control of the lighting in the weaving shed mentioned above, and Fig. 7 shows two of the four photo-cells used; the cells are located between the double glazing of the North light roof. One end of the shed is shadowed by a multi-storey building, and the sequential switching is so arranged that the four "A" rows at that end of the shed operate first, followed by the remaining 13 "A" rows. Then follow the "B" and "C" rows, first the four at the shaded end and then the remainder. Settings were determined by trial and error.

Experience has shown that operatives are assisted by photo-electric control, and supervisors are relieved of the necessity of hand switching. The normal operation of the system reveals, however, that the number

of switchings per day can often be as many as nine or ten and this reduces the life of fluorescent lamps.

The spinning mill shown in Fig. 1 is also equipped with photo-electric control for some 2,600 incandescent lamps. In this installation the sequential switching is designed to take place in four stages when the daylight level falls below 1,000, 700, 350, and 70 lm./ft.$^2$, the rows of lights switched on at each stage being determined by the daylight conditions in various parts of the mill.

## (7) Special Lighting

### (7.1) Local Lighting

In a previous study of lighting in the textile industries, reference was made to certain operations which cannot be performed adequately without the aid of local light sources. One such operation is that known as "drawing-in," a process which precedes weaving and in which the warp threads are drawn through the heald eyes and reed. So far as the author is aware, no really satisfactory scheme has yet been devised which will give adequate illumination without causing discomfort glare to one of the two operatives employed. Apparently the only real advance made in the solution of this problem has been the development of the "drawing-in" machine, which renders the operation semi-automatic and certainly makes the visual task less severe.

The "drawing-in" machine contains within itself a lighting panel to assist close vision, but this idea of "built-in" lighting seems to have achieved little further success in this country. In America, however, an interesting development has been the use of portable fluorescent lamps for carding in the worsted industry. Thirty-watt lamps mounted vertically in adjustable reflectors are used at each side of the machine to give an illumination of 70 lm./ft.$^2$ on the condenser aprons. In this country a somewhat similar result has been gained by using tubular fluorescent lamps in angle reflectors suspended above, and in front of, the condenser end of the machine.

### (7.2) Cloth Inspection

During recent years it has been appreciated that the inspection of cloth, traditionally carried out in daylight, can be done just as effectively, if not more effectively, under

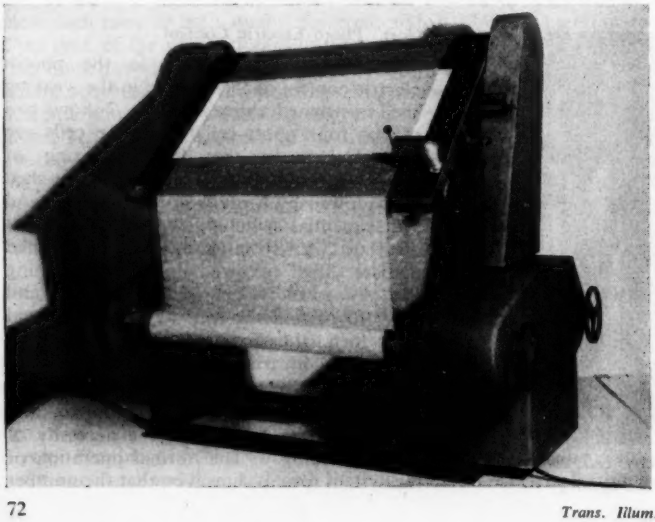

*Fig 8. Cloth inspection machine.*

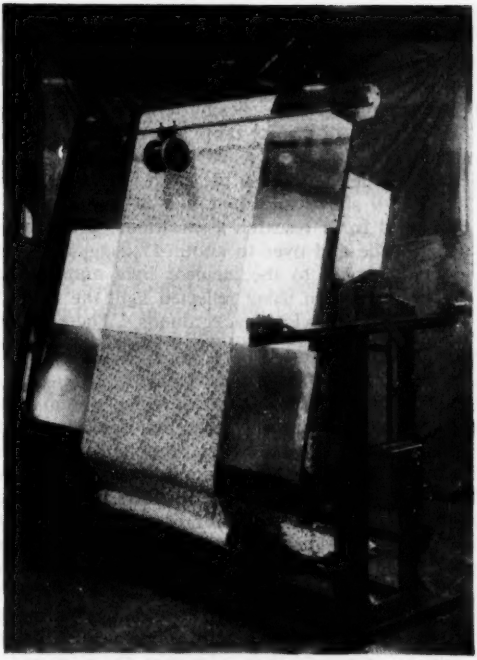

*Fig. 9. Adjustable arrangement for cloth inspection.*

artificial lighting. One American manufacturer in the worsted industry carried out inspection under North sky daylight, but it was found that the illumination level at the inspection point varied, even during periods of "good" daylight, from 100 to 400 lm./ft.$^2$ on the vertical plane in which the cloth was examined. A system has now been adopted employing "perches" of fluorescent lamps. Each perch consists of five trough fittings each containing two 40-watt lamps, the perch being suspended behind the head of the examiner (with the tubes upright) and tilted downwards towards the vertical cloth at such an angle that undue reflections are avoided. The illumination is 375-400 lm./ft.$^2$ with a general illumination of 30 lm./ft.$^2$ in the remainder of the room. This scheme has been so successful that it has been found profitable to carry out all cloth examination under artificial light.

It is not sufficient, however, to examine cloth by reflected light only, for although this may show unevenness in weaving, discolourations, etc., other faults such as pin holes, broken threads and thick ends are best shown by transmitted light. Various methods of passing cloth over a lighted panel have been investigated and a cloth inspection machine developed, an example of which is shown in Fig. 8. This machine facilitates the measuring of the cloth as well as its inspection, control of speed and tension being provided. The panel consists of a sheet of $\frac{1}{4}$-in. plate glass, ground on one side only and back-lighted by means of a tubular fluorescent lamp. The lamp is offset from a suitably contoured matt white reflector, which is viewed through the panel and provides a uniformly bright surface. Often one lamp only—either 40 watt or 80 watt according to the width of the machine—is necessary, but for the examination of certain materials a much higher background brightness is required. For instance, a machine which was specially designed for the examination of materials

used in the construction of cameras required 12 40-watt lamps behind a panel measuring 40 in. × 22 in., whilst another machine, intended for examining overcoat materials, required a total loading of 1,600 watts.

It is usual also to employ fluorescent lamps above cloth inspection machines for the examination of fabrics by reflected light. Further, it is convenient if arrangements can be made to inspect fabrics at oblique angles, for it is found that small checks and stripes tend to merge when viewed from a direction normal to the surface, and this effect is much reduced if the cloth is seen at grazing angles.

Fig. 9 shows an adaptation of the orthodox inspection machine which has been developed for a research association. The table is made to tilt almost to the vertical on one side and over to about 45 deg. on the other side. This facilitates inspection at many angles to the incident light and also allows the cloth to be photographed with ease. When using reflected light the table can be masked in sections to provide either black or white backgrounds. There is, therefore, complete control of lighting conditions, and the addition of ultra-violet lamps to reveal oil stains, etc., completes the whole system.

### (7.3) Colour Matching

During the last few years new sources of artificial daylight have been developed, consisting either of a special "colour-matching" fluorescent lamp (hot cathode or cold cathode) or of composite units employing combinations of blue fluorescent lamps and incandescent lamps. These sources have been described before this Society[8], and as they are now used fairly widely in the textile industries it is only necessary to attempt to assess the results they have achieved.

Accurate colour-matching is usually done under natural light from a North sky, but many textile concerns have found modern artificial sources to be so effective and so constant that they have abandoned the use of the more variable natural light altogether. There are certain minor criticisms, however, which should be noted. For instance, it is said that colours in the deep red part of the spectrum are difficult to match under artificial daylight. Also, it is not easy to detect the very small shade differences which may occur when successive pieces of cloth are passed through the same dye. On the whole, however, these artificial sources are proving very acceptable in the textile industries.

## (8) Conclusion

Much could be written about the lighting problems associated with the many operations in the textile industries, but the above examination of modern methods and equipment leads to the following conclusions:—

The textile manufacturer has learnt to regard lighting as a production tool, and now appreciates that to be generous with light is a means of increasing output, reducing spoilage and maintaining the morale of workpeople.

The textile operative has largely secured the benefits of higher illumination levels, and is on the way to securing those additional benefits which arise from lighting of good quality.

The installation contractor, who must have suffered some tribulations in the early days of fluorescent lighting, now deals with simpler fittings of better design, and in the more modern mills finds fewer overhead obstructions.

The lighting engineer can look upon the progress of lighting in the textile industries with some satisfaction, though in the knowledge that much work remains to be done in improving the quality of lighting and in the solution of specific problems.

The author wishes to thank Thorn Electrical Industries Ltd. for permission to present this paper. Grateful acknowledgment is also made of the assistance given in the preparation of the paper by manufacturers of textile products and by members of the staff of The North-Western Electricity Board.

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## Discussion

MR. B. C. ROBINSON: My mind goes back to the I.E.E. paper of 1949 by Cox and Swale, which reviewed the use of electricity in the cotton industry. At the end of that paper suggestions were made for four or five further papers which could supplement and amplify that general review. One was a paper on the illumination in cotton mills. That challenge has never been taken up so far as I know by the I.E.E., but it has been taken up to-night by Mr. Hewitt in this paper to our Society, in which he has dealt with lighting for the whole of the textile industry. I welcome this step, and have great pleasure in opening the discussion on this outstanding paper.

My own concern is with man-made fibres. Some 30 years ago I had some experience of various mills in Lancashire and Yorkshire and tried to show that something better could be done than pendant lamps with conical shades dotted about, mounted always in the line of vision and giving very patchy illumination. Some of us succeeded in persuading manufacturers that the dispersive reflector, with its specified angle of cut-off and higher mounting, was not only better but could also be economic.

We have moved a long way since then and we are in the 50's instead of the 20's. We now think of lighting in terms of fluorescent lamps, which, I agree with the author, are very well adapted to the problems of most textile production work.

We find in the processing and manufacturing of man-made fibre that there is a great emphasis on the need for light on the vertical plane. We get many machines where the task is to look not down but across. In my present company we have jobs even worse than those Mr. Hewitt mentioned, where light was required from four feet down to the floor. We have requirements for good lighting from eight feet above the floor down to 18 in. The light has to be thrown into an alleyway where the operative has just room to get through; there is a high machine with bobbins, and immediately back to back a similar alleyway. The centres are from five to six feet, and you have to get the light on to the thread on the vertical plane.

I want to ask the author about contrast between the thread and the background. We are experimenting with a backboard or sighting board. We know there is a tendency to have bright coloured machines, but we need a dark background against which to view the white yarn, especially if it is exceptionally fine and has to be seen while passing at high speeds. The bobbin speed in nylon throwing is frequently 12,000 r.p.m. Has the author any experience in the use of sighting boards?

Turning to economics, my own calculations have been similar to those of the author, but in outlining them I do not want to give the impression that I place undue importance on the economic side; I am a great believer in the right light for the job, but when you are designing an installation and the issue at stake is whether to spend or not to spend £150,000 on one project for fluorescent lighting equipment, you have to produce convincing figures.

First we worked out fixed annual charges, the fittings and installation being capitalised over ten years as decided by the chief accountant. Then, as it was a new installation, we took into account the higher cost of transformers and distribution

for a tungsten scheme compared with fluorescent equipment, and capitalised this again over ten years. I included cleaning in the fixed annual charges because it is independent of the amount of use. Next, as costs proportional to hours of use, we have lamp replacement (including labour), maintenance of fittings and equipment, and charges for electricity consumed. I will not give the figures we worked out in 1946, but will try to bring them up to date. This, in my opinion, is what they would look like to-day:—

With lighting at an average of one penny per unit overall, including demand charges, then if we were using light for 1,750 hours per annum we could fully justify a fluorescent scheme against tungsten on economic grounds alone. If it were 1½d. a unit, the time would be 1,250 hours. If you work 44 hours a week for 50 weeks a year, you work 2,220 hours, plus the time of cleaning and maintenance, which generally involve additional hours of lighting. In our factory we work 24 hours a day, 8,600 a year, and have little help from daylight. Artificial lighting is in operation the whole time and there is practically no switching. With such ideal conditions we have always had very good useful life from fluorescent lamps. At first our architects considered having no windows at all, but we thought it was better to have a little daylight and let the workers see through a window when they came to the end of the machines. I do not like the idea of shutting out daylight completely. You may have to have double windows because of heat loss, but that is a justifiable expense.

I turn now to local illumination values. For inspecting cones and bobbins of yarn we employ local units, carefully concealing the light source from the operative. He is sitting at a little table and the cones come to him automatically on a conveyor. The intensity is approximately 130 lm./ft.$^2$ at the point of inspection, with not less than 15 lm./ft.$^2$ in the surrounding area, so that the contrast is not too great. We have had no complaints and the yarn is very well inspected.

One of our problems, which is perhaps special to us, concerns warping. We do no weaving, as we only produce nylon yarn, but some of it is sent out as warps on weaver's beams. A warp may be made up of nylon threads of 60, 45, 30 or 15 denier, and 15 denier is very fine indeed; 9,000 metres of this yarn weigh only 15 grammes. For lighting in a warping area, where from 5,000 to 15,000 threads in parallel go to make up a weaver's beam, the illumination at the reed is not less than 50 lm./ft.$^2$. I should like the author's comments on this installation.

MR. J. W. HOWELL: This is an extremely interesting paper, but I think the author would be the first to admit that it is quite impossible in a paper of this character to cover all the operations that we find in various textile industries. He will not be surprised, therefore, that I disagree with him about some of the propositions which he has put forward, because I am concerned with another section of the industry with which he has dealt only briefly.

I think that we may claim that the woollen and worsted industry is very nearly the largest, if not the largest, of the textile industries. Most of the premises are old, and it would be quite misleading for this audience to run away with the idea that the slides we have seen are typical not only of the cotton industry but also of the woollen and worsted industry. I know very few new woollen and worsted premises. Many of the remarks which have been made apply, therefore, to modern premises, and not to the practice typical in many of our mills.

I would like to refer next to Section 3 dealing with visual tasks. There is a reference to yarn or cloth which is white or near white. That is true of cottons, but it is not true by a long way of the worsteds and wools, which are often dyed in yarn form. You have colours, therefore, which are particularly difficult when you get them on the mule spinning frames, seen against an oily floor.

Next—the detection of faults on looms. Even in old premises there are some

up-to-date machines, and the modern loom is fitted with automatic feelers which will find the faults, although not repair them; the weaver's job is quickly to pick up the broken end and repair it.

Turning to the quality of illumination, I have always found it a little difficult with weaving to decide whether to recognise the dropped end by a break in the specular reflection on the surface of the material, or by a shadow cast by the dropped thread. Specular reflection can be useful with slightly reflective materials, but with matt surfaces the result may be entirely different. Mr. Hewitt will, no doubt, agree that with spinning frames we very often have a polished metal plate at the back of the ring spinning process which can give rise to very trying specular reflections.

I am disturbed about his paragraph which refers to choice of colours for decoration and machines where he asserts that little attention has been paid to colour treatment. I beg to differ. Extensive tests have been carried out in the cotton and woollen and worsted industries and a booklet has been published on lighting and colour treatment in worsted plants by the Wool and Allied Textile Employers' Council. Lancashire mills are also using colour schemes quite extensively.

The author says "A full consideration of the economics . . . is made difficult . . . " because of the difficulty of securing factual information. As one who has been responsible for quite a lot of investigation in textiles, I do not think that is correct. There is a good deal of very extensive evidence available. Reference is made to some of this at the end of the paper, but there is other evidence of equal importance.

Turning to maintenance costs, the author says there is a good deal of "fly" in the cotton and wool industries. We call this fluff "combings" in Yorkshire, since it emanates from the combing process. The author has spoken of brushing down fittings, but I hesitate to speculate on what might happen to some fittings of which I know, if that procedure were adopted. I wonder what the effect of too much brushing would be on plastic fittings, particularly as we know that already there are difficulties of electrostatic charges, which in themselves attract dust in spite of the use of anti-static agents.

I should like to know why Mr. Hewitt defends the use of bare lamps. This is one of the things I have been trying to abolish for years.

The next point concerns the use of bare lamps in a wet spinning process. The author has already indicated that certain steps were taken to prevent corrosion. I should like to know whether he has experienced any trouble from corrosion of lamp contacts.

In dealing with special lighting and local lighting, I want to refer to something concerning neither wool nor cotton, but artificial silks. The twist of artificial silk is defined by a fugitive tint, though "ends" are knotted by an automatic "knotter" in the "drawing in" room. The difficulty is that if an operative works on that process for about half an hour, he may become almost completely colour blind. You can have pale yellow, pale pink and pale blue side by side, each defining a different twist, which has to be connected to its opposite number. If you lost your sense of colour perception you have to sit down and wait for your eyes to recover, which sometimes takes up to half an hour, with a consequent serious loss of production.

I think the author is aware that you can match certain dyes under one colour matching unit and then, when they are compared under another colour matching unit, having the same nominal blackbody temperature and spectral quality, a colour difference can be seen. The base of the dye or pigment will affect the result—i.e., whether it is mineral or vegetable essence. We are also aware that older dyers prefer not to match reds because of the ageing of the eyes.

Dealing with cloth inspection, in the North we had a considerable amount of

cloth returned from the United States where imperfections were found on tests. I think we thought we knew how to perch cloth in Yorkshire, but the Americans and the Canadians suggested that we needed an illumination of something like 450 lm./ft.$^2$ although we can actually see the faults at much lower levels.

We are beginning to see the takeover by carefully controlled artificial windows from daylight, although my experience does not agree with some of the methods suggested by the author for "perching."

I know mills where they are completely eliminating daylight. These are mills where colour is being used extensively and where there are no windows, the only daylight admitted being through glass bricks almost at ceiling height. In these premises lighting fittings are built into the ceiling and the colour scheme is carefully planned even to the overalls worn by the operatives.

MR. S. ANDERSON: I have thoroughly enjoyed listening to the paper, not least because a long time ago I spent several months studying textile lighting problems, although I have had little to do with them more recently. There are one or two points on which I agree heartily with the author and some on which I must join issue with him.

In the days when I was concerned with the problem, we had not the benefit of the fluorescent lamp to serve as a local light source at the doffing end of the woollen carding engine, but I agree that to use the lamp amongst the rollers at that end seems a very suitable application. I should be interested to know what the author's experience is of the collection of fluff, particularly oily or damp fluff, around the electrical parts involved. In another context, where fluorescent lamps are mounted in the framework of looms, I have recently met a problem which is new to me concerning the breakdown of phenolic insulating components due, so I am informed, to the deposits of this fluff or "fly," which one inevitably gets in textile manufacture. I think it would be possible to devise equipment which is so well sealed against the ingress of the fluff that such troubles would be avoided, but the cost and bulk of such equipment might well divest it of much of the attraction of local use so close to the working process.

I should like to join Mr. Howell in doubting the wisdom of bare tubes or bare lamps of any sort for creeling and beaming processes. From the illustrations which the author gave I could see no good reason for bare tubes, because the level of the tube was well above the top of the creel frame. I know that in some factories creels run right up to the ceiling, and to deal with the top bobbins one needs a unit emitting light practically through 180 deg. in the vertical plane, but this was not so here. It seems unfortunate to imply that this is the best arrangement of lighting when a skirted reflector—or a fitting with screens of glass or plastic perhaps, would have been less glaring and would have made a better job. It may be that it was a struggle to get fluorescent lighting put in at all, and the capital cost had to be studied very carefully, but as lighting engineers we should not deceive ourselves that unscreened lamps constitute the best arrangement.

Turning, next, to the diagrams of wet spinning, I agree that in general the frames are sufficiently high and the bobbins and equipment on them are sufficiently solid to give a fairly effective screen to the minders, particularly as, in my experience, many are rather short in stature. But I do not think this is the only aspect we should consider. I remember that very often the alley between the frames is very long, sometimes up to 50 or 60 ft., and one woman is probably looking after a whole gate in these days of scarce and expensive labour. She must spend a lot of her time glancing along the frame, which means that she will have no screen between her and the light sources. Possibly a simple form of transverse louvre—not necessarily in a trough reflector—would meet the need. It may be that louvres would be ruled out on the

score of collecting too much dirt and fluff, but that could be avoided by suitable design and adequate maintenance.

The author mentioned drawing-in as a very difficult problem from the lighting point of view. It certainly was 20 years ago. I should have thought that ingenuity had more or less overcome the problem, particularly as I imagine most of the drawing-in must now be done by automatic machines which, once set up, operate satisfactorily without anyone taking a very close interest in them.

I was interested in the first illustration of a perching frame against a large window. The illumination which is desirable for that job is undoubtedly of the order of several hundred lumens per square foot, particularly when woollen materials are concerned, so many of which are dark in colour. While it may be that with a light material the four or eight fluorescent lamps shown in the illustration would give visibility satisfactory for perching, it should be pointed out that a considerably larger bank of tubes may well be necessary to provide equal facilities with dark material.

I was interested in Mr. Howell's comment that artificial light, suitably arranged, is found by some to be better for the whole of their perching than when it is merely used when the daylight is poor. In the old days the perchers used to say they could not work when the daylight was poor, and in consequence they did comparatively little work in the winter. This provides one outstanding example where modern artificial light sources and methods have enabled the textile industry to improve inspection and output in a way which was never envisaged in the days when they had to rely almost entirely on daylight. I am not certain, however, what type of "artificial daylight" is meant here. Perhaps the author would give details to indicate whether he has found that some type of fluorescent lamp alone is adequate, or whether he is advocating a mixed system of fluorescent and filament lamps.

MR. J. G. HOLMES: Is there any temperature limitation or are there any fire risks with combings or fly, which settle on lighting fittings in thick cobwebs unless the fittings are frequently cleaned?

During his paper, the author referred to "plastic enamel." My information is that most stove enamels are plastic in nature and I wonder whether Mr. Hewitt used the term with some special significance.

MR. HEWITT (*in reply*): I was interested in Mr. Robinson's information about the economics of lighting in the nylon industry and particularly pleased to find that his figures bore out the contentions I have made on a wider basis for the use of hot cathode fluorescent lighting throughout the textile industries generally. In contrast to the other principal speakers he thinks it desirable, from a psychological point of view, to have some windows in a factory even when the factory lighting is always artificial, and I agree that some windows are a good thing.

Mr. Robinson asked whether I had any experience of an artificial dark background to provide contrast against which fibres could be seen. I have no experience of this. The only related experience is that of a small drawing-in device which was introduced into the cotton industry about three or four years ago. This employed a back-lighted panel of acrylic plastic against which threads were seen in silhouette.

Mr. Howell first of all took me to task because I did not show the old-fashioned mills which they have in Yorkshire. It was not my intention in this paper to review the older mills, which are still content with poor lighting. The intention of the paper was to review the progress which has been made, and is being made, in modernising the mills and the lighting in those mills. I do not think he should expect me, therefore, to show pictures of his establishments in Yorkshire.

At the same time, I recognise that he has very admirably provided us with information about the worsted industry which supplements the information contained in the

paper. It surprises me to know that they have many mills with designed colour schemes in Yorkshire. We have only few examples in Lancashire, and it is pleasing to know that the adoption of this colour treatment is going on rapidly in some parts of the textile industry.

Mr. Howell says there is plenty of evidence on lighting costs. I am very pleased to know this, and disappointed that the evidence has avoided me. For many months I was collecting information from all types of textile concerns on both sides of the Pennines and elsewhere in the country, and although much of this data was interesting and useful, rarely was it possible to get the complete story for one installation—chiefly because it was difficult to find out either the cost of the energy used for lighting purposes only, or the real cost of lighting maintenance.

I ought to have mentioned that in wet spinning rooms rubber sleeves were used over the lamp caps to prevent the ingress of moisture. I do not think the brushing down of fittings has the unfortunate consequences which Mr. Howell suggests—certainly not in the textile plants where I have discussed maintenance methods.

Mr. Anderson asked whether there was any trouble with the deposit of "fly" on electrical contacts when the fluorescent lamp was used for local lighting in the tape condenser. In the installation which I showed, no special precautions were taken except for regular cleaning—much more regular cleaning than for the general lighting installation.

Perhaps the picture of the bare lamp for creel lighting was a little misleading. The level of the top bobbin is, in fact, at about the level of the lamp. The orthodox trough reflector would have detracted from the illumination at the top of the creel, and I think, therefore, that use of the bare lamp was justified here.

I agree with Mr. Anderson's comments about the end-on view along the gate between wet-spinning frames, and if cross louvres could be provided without adding to the maintenance difficulties, it would probably be an improvement. The general sight-line, however, is across the frames and there is adequate cut-off for that purpose.

Mr. Anderson asked whether drawing-in had become an automatic process; I am sorry to tell him that it has not to any great extent. It is only in the last few years that drawing-in machines of various types have been developed and they are not yet in very wide use. On the question of artificial daylight, he asked me whether I favoured the fluorescent lamp or combinations of fluorescent and incandescent lamps. Mr. Howell will remember an ambitious exhibition in Leeds a few years ago when almost all artificial daylight sources were demonstrated to the textile industry. The textile people were asked to come along and bring samples to match under the various units. I think the results of the "Gallup poll" taken on that occasion were interesting but basically they proved only one thing—that there is not much difference between any of the more modern colour matching sources on the market at the present time. All are apparently very useful indeed to the textile industries, bearing in mind the one or two minor criticisms to which I have referred in the paper, such as the difficulty with the repetition of the same shade (or what you hope is the same shade), when passing successive pieces of cloth through the same dye, and the difficulties of accurate colour discrimination at the deep-red end of the spectrum.

Replying to Mr. Holmes, there is considerable fire risk in connection with "fly" in textile interiors, and precautions have to be taken to make sure there is not a conflagration. I do not think, however, that the lighting installation has often been blamed for fires in textile mills.

# Report of the Council

## (January 1 to December 31, 1953)

The Council has the honour to present its report upon the affairs of the Society during the year ended December 31, 1953, this year being the forty-fifth in the life of the Society.

### Officers and Members of Council for Session 1953-54

In accordance with the procedure laid down in the Articles and By-laws of the Society, nominations made by the Council to fill vacancies for the Session 1953-54 were circulated to Corporate Members who were given an opportunity to make additional nominations. One such additional nomination for ordinary membership of Council was received and a postal ballot was held. The names of those elected to fill the vacancies for officers and members of Council for the Session 1953-54 were as follows:—

*President*: Mr. W. R. Stevens.

*Vice-Presidents*: Mr. H. G. Campbell, Dr. W. E. Harper, Mr. A. H. Owen, Mr. J. F. Stanley, Mr. W. J. P. Watson.

*Hon. Treasurer*: Mr. E. B. Sawyer.

*Hon. Secretary*: Mr. H. C. Weston.

*Hon. Editor of the Transactions*: Dr. W. E. Harper.

*Ordinary Members of Council*: Mr. N. Boydell, Mr. C. Dykes Brown, Mr. T. Catten, Mr. H. Hewitt, Mr. H. G. Jenkins, Mr. W. Robinson, Mr. D. A. Strachan, Dr. W. S. Stiles.

A casual vacancy for a period of two years arose through the election to the presidency of Mr. W. R. Stevens. Acting in accordance with Article 50, the Council appointed Mr. N. C. Slater to fill this vacancy.

The following were appointed to represent their respective Centres on the Council for the Session 1953-54 :—

*Bath and Bristol*: Mr. R. W. Steel. *Birmingham*: Mr. Howard Long. *Cardiff*: Mr. W. E. James. *Edinburgh*: Mr. W. C. Crawford. *Glasgow*: Mr. W. Quinn. *Gloucester and Cheltenham*: Mr. M. C. Hughes. *Leeds*: Mr. J. W. Howell. *Leicester*: Mr. G. Stephens. *Liverpool*: Mr. W. Gilchrist. *Manchester*: Mr. J. S. Smyth. *Newcastle*: Mr. C. C. Veitch. *Nottingham*: Mr. N. C. Slater. *Sheffield*: Mr. J. Dean.

It would appear that the procedure for the election of members of Council, and, to some extent, the duties and responsibilities of members of Council, are not fully understood by all members, and a brief explanation might therefore be helpful. The procedure for election is laid down in the Articles of Association. About January each year members of Council are asked to make nominations of members whom they consider are suitably qualified to serve as members of Council; the list of those nominations is then considered by the Council and eight names to fill the eight vacancies which occur each year are selected. This selection must ensure that three of the eight have not previously served on Council in any capacity, and must also have regard to the different interests within the Society as a whole. These names are then published for the information of all members. If any group of ten members wishes to make an

To be presented at the Annual General Meeting of the Society to be held at the Cambridge Hall, Southport, at 4.0 p.m., on Friday, May 21, 1954.

independent nomination it may do so, a postal ballot of all Corporate Members being then required to select the eight names to fill the eight vacancies on Council.

The task of the Council in selecting its eight nominees is not an easy one. The interests of members of the Society are so varied and their geographic distribution so wide that it is impossible to produce a formula which will always ensure specific representation of all interests and areas and yet produce a workable Council as well as—what is equally important—workable committees; many efforts to produce such a formula in the past have had to be abandoned. It is therefore left to the good sense of members of Council to nominate those who have a keen interest in the Society as a whole and who are believed to have knowledge and qualities which fit them to act as managers of the Society's affairs rather than to represent any one particular interest. It may be emphasised at this point that though the chairmen of Centres are appointed each year as representatives on Council of their particular Centres, their status during their term of office is exactly the same as that of ordinary elected Council members: they have the same right and duty to give counsel concerning the affairs of the Society as a whole, the same voting power and the same responsibility to the membership at large. It is true that in general they serve on Council only for one year, but since the Council minutes for the preceding year are accessible to each Centre Chairman before he takes office, he commences his duties as a member of Council with full knowledge of the business transacted during his predecessor's term of office. Centres' representatives on Council also enjoy a privilege denied to other Council members, namely that of sending a deputy to any meeting which they cannot themselves attend.

## Attendance at Council Meetings

The attendances of ordinary members of Council and representatives of Centres at Council meetings during the year is given in the accompanying table.

(a) Elected Members of Council

| Name | Possible attend. | Actual attend. | Name | Possible attend. | Actual attend. |
|---|---|---|---|---|---|
| D. S. Allom | 8 | 4 | D. L. Tabraham | 8 | 5 |
| S. Anderson | 8 | 7 | G. G. Baines | 5 | 1 |
| A. D. S. Atkinson | 8 | 6 | S. S. Beggs | 5 | 4 |
| B. F. W. Besemer | 8 | 5 | L. H. McDermott | 5 | 0 |
| N. Boydell | 8 | 7 | A. H. Olson | 5 | 3 |
| F. M. Hale | 8 | 5 | A. G. Penny | 5 | 4 |
| P. Hartill | 8 | 1 | H. C. White | 5 | 1 |
| R. G. Hopkinson | 8 | 5 | C. Dykes Brown | 3 | 2 |
| T. S. Jones | 8 | 0 | T. Catten | 3 | 2 |
| R. A. Lovell | 8 | 5 | H. Hewitt | 3 | 3 |
| J. S. McCulloch | 8 | 6 | H. G. Jenkins | 3 | 2 |
| A. R. McGibbon | 8 | 2 | W. Robinson | 3 | 3 |
| C. W. M. Phillips | 8 | 1 | N. C. Slater | 3 | 2 |
| W. T. F. Souter | 8 | 4 | D. A. Strachan | 3 | 2 |
| J. W. Strange | 8 | 4 | W. S. Stiles | 3 | 0 |

(b) Members of Council Appointed (Annually) by Centres

| Name | Possible attend. | Actual attend. | Name | Possible attend. | Actual attend. |
|---|---|---|---|---|---|
| Bath and Bristol | 8 | 6 | Leeds | 8 | 4 |
| Birmingham | 8 | 5 | Leicester | 8 | 1 |
| Cardiff | 8 | 3 | Liverpool | 8 | 2 |
| Edinburgh | 8 | 0 | Manchester | 8 | 5 |
| Glasgow | 8 | 2 | Newcastle | 8 | 5 |
| Gloucester and Cheltenham | 8 | 0 | Nottingham | 8 | 2 |
| | | | Sheffield | 8 | 4 |

## Standing Committees

The standing committees as from October, 1953, were constituted as follows :—

GENERAL PURPOSES COMMITTEE: W. R. Stevens (*President*), W. J. Wellwood Ferguson (*Past-President*), H. G. Campbell, W. E. Harper, A. H. Owen, J. F. Stanley, W. J. P. Watson (*Vice-Presidents*), E. B. Sawyer (*Hon. Treasurer*), H. C. Weston (*Hon. Secretary*), W. Gilchrist (*Liverpool Centre*), N. C. Slater (*Nottingham Centre*).

PAPERS COMMITTEE: D. A. Strachan (*Chairman*), S. Anderson, A. D. S. Atkinson, T. Catten, H. G. Jenkins, T. S. Jones, A. R. McGibbon, W. Robinson, J. W. Strange. Co-opted: J. S. McCulloch, J. G. Holmes, A. H. Young.

EDUCATION COMMITTEE: J. W. T. Walsh (*Chairman*), R. O. Ackerley, C. Dykes Brown, H. Hewitt, F. M. Hale, J. T. MacGregor-Morris, C. W. M. Phillips, D. A. Strachan. Co-opted: G. F. Freeman.

CODE COMMITTEE: H. C. Weston (*Chairman*), R. O. Ackerley, R. G. Hopkinson, F. C. Smith, W. T. F. Souter, W. S. Stiles, D. L. Tabraham. Co-opted: W. Allen.

CENTRES JOINT COMMITTEE: One representative from each Centre; three ordinary members of Council—N. Boydell, H. Hewitt, W. Robinson.

AWARDS JUDGING COMMITTEE: B. F. W. Besemer, W. E. Harper, J. G. Holmes, W. Robinson, D. A. Strachan, J. M. Waldram.

The President, Hon. Treasurer and Hon. Secretary are ex officio members of all committees.

## Meetings in London

Meetings in London included ten sessional meetings, three informal meetings and a number of visits. The number of sessional meetings was larger than usual as two meetings, of exceptional interest, were added to the programme after arrangements for the session had been announced. At one of these meetings the entries for the first Dow Prize Competition were displayed and discussed, and at the other Dr. Ward Harrison, President of the International Commission on Illumination, talked on lighting in the United States. The visits of Dr. Harrison, who is an Honorary Member of the Society, to this country are infrequent and we were delighted to meet and hear him again. We also had the pleasure of an address from an overseas speaker at the Annual General Meeting on May 12 when we welcomed Mr. D. C. B. Maclurcan, a past-president of the National Council of the Illuminating Engineering Societies of Australia, who made some comparisons between European and Australian lighting practice. A third overseas speaker during the year was Mr. J. N. Hull who left this country a few years ago to join the Dominion Physical Laboratory in New Zealand. Members of the Society welcome opportunities of hearing of progress in other countries and the Council wishes to express its appreciation to these three speakers for their addresses.

One of the outstanding meetings of the year was the Trotter-Paterson Memorial Lecture given at the Royal Institution on January 28 by Dr. E. D. Adrian, O.M., P.R.S., Master of Trinity College, Cambridge, who spoke on the nervous reactions of the retina. The Society is proud that this lecture was given by so eminent a scientist.

Mention must also be made here of the informal meeting held on March 25 when several short papers were given by student members of the Society. The high standard of the papers and of their presentation, together with the ability with which the authors replied to the discussions, was most encouraging.

The Council expresses its thanks to the Royal Institution, the Royal Society of Arts, the London School of Hygiene and Tropical Medicine and the Wellcome Research Institution for facilities made available to the Society during the year for the holding of meetings, and especially to the Lighting Service Bureau for continued hospitality to the society for a similar purpose.

**Sessional Meetings in London**

| DATE | SUBJECT | AUTHOR |
|---|---|---|
| January 13 | Power Station Lighting | P. D. Figgis |
| February 10 | Colour in Schools | David Medd |
| February 25 | Display of entries of the Dow Prize Competition and report of the assessors | |
| March 10 | Discussion on Office Lighting | P. V. Burnett |
| April 14 | Sports Lighting | M. W. Peirce |
| May 12 | Annual General Meeting | |
| | Address on Lighting in Australia and Europe | D. C. B. Maclurcan |
| June 11 | Lighting in the U.S.A. | Ward Harrison |
| October 13 | Presidential Address | W. R. Stevens |
| November 10 | Application of Fluorescent Dimming Circuits | H. H. Ballin and W. J. Vine |
| December 8 | Lighting for Textile Production | H. Hewitt |

## Centres and Groups

On the whole the activities of Centres and Groups have been well maintained though one or two of the smaller Centres have found it difficult to produce attractive programmes to retain the interest of their members. The Council is well aware of the difficulties of Centres and Groups in this respect and is considering ways of helping them to continue and expand their activities. It will be recalled that in its Report for 1952 the Council urged Centres and Groups to encourage their own members, particularly younger members, to prepare and present papers; Council again stresses this point as it feels that there is considerable talent available which for want of opportunity has not yet been utilised.

During the year most of the Centres were visited by the President. However, during his year of office the President's time is fully occupied and he is unable to visit all Centres. It has been suggested that those Centres which are not visited by the President should make arrangements in their programmes for a visit from one of the Vice-Presidents who could attend a meeting of the Centre or a social function and also, if desired, a meeting of the Centre committee.

During the summer a successful experiment in the form of a one-day meeting in Nottingham was made jointly by the Nottingham, Birmingham, Leicester and Sheffield centres. Technical meetings were held in the morning and afternoon of July 10 at Nottingham University which provided excellent facilities. The programme included visits for the ladies and the meeting concluded with a dinner in the evening. Council has recommended that other Centres might study the organisation of this meeting which might well be adapted to suit local needs; it may be that the holding of such one-day meetings at which larger attendances might be expected would be more attractive to members, and to lecturers, than more frequent but less well attended

evening meetings. The Council congratulates the organisers of the Nottingham meeting and expresses its thanks to Nottingham University for its help and to Prof. H. Cotton and Mr. H. Asher who presented papers.

The Council is mindful of the fact that the success of the Centres and Groups is largely due to the enthusiasm of the local honorary secretaries. At December 31 the offices of chairman and honorary secretary of each Centre and Group were filled by the following:—

| Centre | Chairman | Hon. Secretary |
|---|---|---|
| Bath and Bristol | R. W. Steel | H. A. Turner |
| Birmingham | Howard Long | W. J. P. Watson |
| Cardiff | W. E. James | J. D. Callaway |
| Edinburgh | W. C. Crawford | G. E. L. Comrie |
| Glasgow | W. Quinn | A. M. Rankin |
| Gloucester and Cheltenham | M. C. Hughes | F. J. Chappell |
| Leeds | L. A. Doxey | J. W. Howell |
| Leicester | G. Stephens | R. Burton |
| Liverpool | W. Gilchrist | F. J. Burns |
| Manchester | J. S. Smyth | T. L. Robinson |
| Newcastle | C. C. Veitch | R. J. Fothergill |
| Nottingham | N. C. Slater | K. J. Goddard and H. J. Slater |
| Sheffield | J. Dean | E. G. R. Taylor |
| Bradford | H. Moss | H. Beevers |
| Huddersfield | J. T. Thornton | E. Wood |
| North Lancashire | J. A. Prowse | H. Wilcock |
| Stoke-on-Trent | R. S. Riddell | J. P. Oliver |
| Sussex | | A. P. Cole |
| Swansea | F. M. Macpherson | S. G. Gorman |
| Teeside | W. J. Miller | W. J. Knowlson |

During the year a request was received from a number of members in South Africa for permission to form a group of the Society in that country. The request was considered by the Council which felt that these members should be given every encouragement. A meeting was therefore held in Johannesburg at which officers were appointed and steps taken to organise the new group. The chairman of the new group is Mr. F. L. Cator, with Mr. R. S. Yates as hon. secretary and Mr. M. J. F. Dempster as hon. treasurer. The first sessional meeting of the group was held in February, 1954.

## Publications

In 1953 nine issues of the Transactions were published, comprising 18 papers and a total of 262 pages. The number of issues and of pages is fewer than estimated because some contributions from overseas, which it was intended to publish towards the end of the year, could not be prepared in time. It should be pointed out, however, that the amount of material published is bound to vary from year to year, and the Council feels that the criterion should be quality of matter published rather than quantity. Every other year, of course, additional material is provided by the papers presented at the society's summer meetings; there was no such meeting in 1953.

Though, in spite of efforts made, too few offers are received of papers for presentation at sessional meetings, there have been a number of offers of written contributions —an indication that the Society's Transactions are recognised as the correct medium for the publication of scientific papers relating to lighting.

Contributed articles published during the year were:—

The colour-rendering properties of fluorescent lamps and a proposed new method of specification, by S. T. Henderson and D. T. Waigh.

The non-additivity of heterochromatic brightnesses, by A. Dresler.

The meeting beams of headlights; effects of deterioration and misaim, by A. J. Harris.

Classification of diffusing materials.
The design of the visual field.
A reflector contour for use with tubular light sources, by R. W. Stevens.
A survey of vehicle headlights, by V. J. Jehu.

The Council would like to express its appreciation to Dr. W. E. Harper for again undertaking the responsibility of editing the Society's Transactions.

Whilst the Transactions keep members informed on the more scientific developments, *Light and Lighting* has continued to improve both its subject matter and its presentation, and is becoming of greater value to members. The increase in circulation of the journal outside the Society not only furthers the aims of the Society but encourages new members. The Council wishes to record its appreciation to the directors of the Illuminating Engineering Publishing Company, Ltd., for the services they are rendering to the Society. From January, 1954, *Light and Lighting* has returned to a large-page size, a step which will enhance its value to members and to the lighting industry as a whole.

## Society Awards

The Leon Gaster Memorial Premium, awarded each year for the best paper presented to the Society and published in the Transactions, was gained this year by Mr. W. D. Chesterman and Mr. J. B. Collins for their paper entitled "Problems of Underwater Illumination."

A number of entries was received for the Silver Jubilee Commemoration Award, most of them being papers which were originally presented by student members at a special meeting of the Society. The award was made to Mr. J. R. Wakefield for his paper entitled "An Investigation of Glare in Mine Lighting." In view of the high standard of entries the Council decided to make a second award to Miss P. M. Excell for her paper entitled "Illumination Calculations for Installations Using Long Linear Light Sources."

The Council is pleased that there were several entries this year, and hopes that younger members of the Society will continue to avail themselves of the existence of this award in order to gain experience in the preparation of papers.

## Membership

During the year two new Fellows of the Society were elected, the total number now being 160.

Additions to membership during the year were :—

| | |
|---|---|
| Corporate Members ... ... ... ... ... ... ... ... | 81 |
| Overseas Members ... ... ... ... ... ... ... ... | 4 |
| Students ... ... ... ... ... ... ... ... ... | 12 |
| Sustaining Members ... ... ... ... ... ... ... ... | 2 |

It will be recalled that at the end of 1952 the classes of membership known as associate and country member were discontinued. The majority of members in those previous classes transferred to Corporate Membership of the Society early in the year.

The total membership at the end of the year, however, was 2,339, a reduction of 56 over the year. Though the Council regret that a decrease, however small, has taken place, it is not unexpected. It is desirable, and perhaps even essential, if the Society is to maintain its present activities, that membership should increase, and the Council is, therefore, looking into the matter to ascertain the cause of the decrease and to review the activities of the Society with a view to making membership attractive to more people.

The Council wishes to thank Sustaining Members for their continued support to the Society during the year; without their support the activities of the Society and its ability to fulfil its aims and objects would be considerably restricted.

## TOTAL MEMBERSHIP (December 31, 1953)

| | Fellows | Corporate Members | Overseas Members | Students | TOTAL | Sustaining Members |
|---|---|---|---|---|---|---|
| **London** ... ... | 88 | 602 | — | 45 | 735 | 53 |
| **Centres :—** | | | | | | |
| Bath & Bristol... | 3 | 62 | — | — | 65 | 3 |
| Birmingham ... | 9 | 226 | — | 8 | 243 | 26 |
| Cardiff ... ... | 2 | 67 | — | 1 | 70 | 2 |
| Edinburgh ... | 4 | 37 | — | — | 41 | 5 |
| Glasgow ... | 5 | 69 | — | 1 | 75 | 7 |
| Gloucester & Cheltenham... | — | 34 | — | 3 | 37 | — |
| Leeds ... ... | 5 | 105 | — | 5 | 115 | 3 |
| Leicester ... | 2 | 37 | — | — | 39 | — |
| Liverpool ... | 2 | 114 | — | 3 | 119 | 8 |
| Manchester ... | 4 | 133 | — | 2 | 139 | 7 |
| Newcastle ... | 3 | 86 | — | — | 89 | 6 |
| Nottingham ... | 4 | 70 | — | 3 | 77 | 1 |
| Sheffield ... | 2 | 59 | — | 6 | 67 | 1 |
| **Groups :—** | | | | | | |
| Bradford ... | 1 | 30 | — | — | 31 | — |
| Huddersfield ... | 1 | 31 | — | 4 | 36 | — |
| N. Lancashire ... | 2 | 52 | — | — | 54 | — |
| Stoke-on-Trent | — | 22 | — | 1 | 23 | — |
| Sussex ... ... | 7 | 27 | — | — | 34 | 1 |
| Swansea ... | — | 20 | — | — | 20 | — |
| Teeside ... | 1 | 21 | — | — | 22 | — |
| **Ireland** ... ... | 2 | 24 | — | — | 26 | — |
| **Overseas** ... | 13 | 107 | 61 | 1 | 182 | 2 |
| TOTAL ... | 160 | 2035 | 61 | 83 | 2339 | 125 |

### Finance

The accounts for the year show an excess of income over expenditure of £724. This is more than had been visualised in the budget and is to some extent due to the publication of only nine issues of the Transactions instead of ten. A net decrease in membership removes any feeling of complacency regarding the finances of the Society and some measures to achieve a reduction in expenditure have been put in hand. The financial structure of the Society is, however, sound and with careful administration there is no reason why the work should not be maintained at its present level.

The balance sheet shows the present market value of investments. On average, there has been a slight change for the better compared with last year.

### Register of Lighting Engineers

During the year the Fellowship and Registration Board considered eight new applications for inclusion on the register, which now contains the names of 242 members of the Society.

# INCOME AND EXPENDITURE ACCOUNT

| 1952 | EXPENDITURE | £ s. d. | £ s. d. |
|---|---|---|---|
| £ | Administration Expenses :— | | |
| 2,079 | Salaries and State Insurance ... ... ... ... | 2,258 4 1 | |
| 163 | Staff Superannuation Scheme ... ... ... ... | 106 8 9 | |
| 367 | Rent and Rates ... ... ... ... ... ... | 375 12 0 | |
| 59 | Lighting and Heating ... ... ... ... ... | 72 19 1 | |
| 81 | Telephone ... ... ... ... ... ... ... | 90 16 5 | |
| 442 | Printing and Stationery ... ... ... ... ... | 323 5 5 | |
| 199 | Postage ... ... ... ... ... ... | 208 10 4 | |
| 102 | Travelling Expenses ... ... ... ... ... | 66 4 2 | |
| 605 | Sundry Office Expenses ... ... ... ... ... | 276 8 11 | |
| 4,097 | | | 3,778 9 2 |
| 238 | Meetings in London ... ... ... ... ... ... | | 277 0 10 |
| 1,140 | Expenditure of Centres and Groups ... ... ... | | 1,132 7 7 |
| 36 | Audit Fee ... ... ... ... ... ... ... | | 36 15 0 |
| 5,511 | | | 5,224 12 7 |
| 1,513 | Cost of Printing Transactions, Reprints, etc. ... ... | | 1,086 13 10 |
| — | Expenditure on Annual Dinner *less* Sale of Tickets ... | | 97 6 0 |
| 104 | Expenditure on Summer Meetings *less* Sale of Tickets ... | | — — — |
| | Illuminating Engineering Publishing Co., Ltd.— | | |
| | Cost of " Light and Lighting " ... ... ... ... | 1,513 12 0 | |
| | *Less* Contribution towards administration ... ... | 500 0 0 | |
| 1,002 | | | 1,013 12 0 |
| 52 | Contributions to Kindred Societies ... ... ... | | 42 10 0 |
| — | Transfer to Leon Gaster Memorial Fund ... ... ... | | 21 0 0 |
| 8,182 | | | 7,485 14 5 |
| 169 | Balance, being excess of Income over Expenditure ... | | 724 10 6 |
| £8,351 | | | £8,210 4 11 |

# BALANCE SHEET

| 1952 | | £ s. d. | £ s. d. |
|---|---|---|---|
| £ | | | |
| | Capital Account :— | | |
| | Balance at 31st December, 1952 ... ... ... | 8,783 11 3 | |
| | *Add* Excess of Income over Expenditure for the year | 724 10 6 | |
| | | 9508 1 9 | |
| | *Less* Depreciation of Investments ... ... ... | 538 14 9 | |
| 7,979 | | | 8,969 7 0 |
| 227 | Creditors ... ... ... ... ... ... ... ... | | 256 17 4 |
| £8,206 | | | £9,226 4 4 |

E. B. SAWYER (*Hon. Treasurer*)
H. C. WESTON (*Hon. Secretary*)

# FOR THE YEAR ENDED 31st DECEMBER, 1953

## INCOME

| *1952* | | £ | s. | d. |
|---|---|---|---|---|
| £ | | | | |
| *7,593* | Subscriptions and Fees ... ... ... ... ... ... ... | 7,564 | 13 | 10 |
| *520* | Sales of publications ... ... ... ... ... ... ... | 399 | 1 | 2 |
| *235* | Interest on Investments ... ... ... ... ... ... ... | 246 | 9 | 11 |
| *3* | Premium on Redemption of Defence Bonds ... ... ... ... | – | – | – |
| *£8,351* | | £8,210 | 4 | 11 |

# 31st DECEMBER, 1953

| *1952* | | | | | | | |
|---|---|---|---|---|---|---|---|
| £ | Investments at cost :— | | | £ | s. | d. | £ s. d. |
| £2,020 14s. 7d. | 3½% War Loan ... ... ... ... | | | 2,059 | 15 | 0 | |
| £1,250 | 3% Defence Bonds ... ... ... | | | 1,250 | 0 | 0 | |
| £1,500 | 2½% Defence Bonds ... ... ... | | | 1,500 | 0 | 0 | |
| £500 | 2½% National War Bonds ... ... | | | 500 | 0 | 0 | |
| £1,500 | 3% Savings Bonds ... ... ... | | | 1,501 | 15 | 3 | |
| £500 | 3% British Transport Guaranteed Stock ... ... ... ... | | | 488 | 4 | 6 | |
| £1,000 | 3½% Defence Bonds ... ... ... | | | 1,000 | 0 | 0 | |
| | | | | 8,299 | 14 | 9 | |
| | *Less* Depreciation ... ... ... (*Market Value 31.12.53, £7,761*) | | | 538 | 14 | 9 | |
| *7,495* | | | | | | | 7,761 0 0 |
| *635* | Balance at Bankers and Cash in Hand ... ... ... | | | | | | 1,412 14 0 |
| *76* | Debtors ... ... ... ... ... ... ... ... | | | | | | 52 10 4 |
| *£8,206* | | | | | | | £9,226 4 4 |

**Auditors' Report.**—We have examined the above Accounts with books and vouchers, and certify same to be correct in accordance therewith and that the Balance Sheet exhibits a true and correct view of the Society's affairs according to the information and explanations given to us.

ROBERT J. WARD & CO., *Chartered Accountants*,
3, ROBERT STREET, ADELPHI, W.C.2.

Dated this 11th Day of January, 1954.

# RECEIPTS & PAYMENTS ACCOUNTS

## LEON GASTER

| 1952 | | | £ s. d. |
|---|---|---|---|
| £ | | | |
| 241 | Balance, 1st January, 1953 | | 238 4 4 |
| 8 | War Loan Interest | | 8 1 0 |
| — | Transfer from General Fund | | 21 0 0 |
| £249 | | | £267 5 4 |

## NATIONAL ILLUMINATION

| | | | £ s. d. |
|---|---|---|---|
| £ | | | |
| 339 | Balance, 1st January, 1953 | | 349 2 9 |
| 10 | War Loan Interest | | 10 10 0 |
| £349 | | | £359 12 9 |

## INTERNATIONAL ILLUMINATION

| | | | £ s. d. |
|---|---|---|---|
| £ | | | |
| 433 | Balance, 1st January, 1953 | | 443 10 6 |
| 11 | Interest on Investments | | 14 0 0 |
| £444 | | | £457 10 6 |

## TROTTER-PATERSON

| | | | £ s. d. |
|---|---|---|---|
| £ | | | |
| 381 | Balance, 1st January, 1953 | | 381 4 6 |
| — | Defence Bond Interest | | 12 5 0 |
| £381 | | | £393 9 6 |

## JOHN S. DOW

| | | | £ s. d. |
|---|---|---|---|
| £ | | | |
| 2,059 | Balance, 1st January, 1953 | | 2,121 5 6 |
| 62 | Interest on Investments | | 69 1 6 |
| — | Income Tax recovered in respect of previous year | | 10 2 6 |
| £2,121 | | | £2,200 9 6 |

# FOR THE YEAR ENDED 31st DECEMBER, 1953

## MEMORIAL FUND

| 1952 | | £ s. d. | £ s. d. |
|---|---|---|---|
| £ | | | |
| 11 | Premiums paid | | 10 10 0 |
| | Balance, 31st December, 1953 :— | | |
| | Cash at Bank | 20 2 2 | |
| | £230 3½% War Loan at cost | 236 13 2 | |
| 238 | (*Market Value 31.12.53, £195*) | | 256 15 4 |
| £249 | | | £267 5 4 |

## COMMITTEE FUND

| £ | | £ s. d. | £ s. d. |
|---|---|---|---|
| | Balance, 31st December, 1953 :— | | |
| | Cash at Bank | 55 4 3 | |
| | £300 3½% War Loan at cost | 304 8 6 | |
| 349 | (*Market Value 31.12.53, £254*) | | 359 12 9 |
| £349 | | | £359 12 9 |

## CONGRESS FUND

| £ | | £ s. d. | £ s. d. |
|---|---|---|---|
| | Balance, 31st December, 1953 :— | | |
| | Cash at Bank | 53 2 0 | |
| | £300 3½% War Loan at cost | 304 8 6 | |
| | (*Market Value 31.12.53, £254*) | | |
| | £100 3½% Defence Bonds at cost | 100 0 0 | |
| 444 | | | 457 10 6 |
| £444 | | | £457 10 6 |

## MEMORIAL LECTURE FUND

| £ | | £ s. d. | £ s. d. |
|---|---|---|---|
| — | Lecture Fee | | 26 5 0 |
| | Balance, 31st December, 1953 :— | | |
| | Cash at Bank | 17 4 6 | |
| | £350 3½% Defence Bonds at cost | 350 0 0 | |
| 381 | | | 367 4 6 |
| £381 | | | £393 9 6 |

## LEGACY FUND

| £ | | £ s. d. | £ s. d. | £ s. d. |
|---|---|---|---|---|
| — | Dow Prize | | | 75 0 0 |
| — | Prize Certificates | | | 49 19 6 |
| | Balance at 31st December, 1953 :— | | | |
| | £916 11s. 1d. 3½% War Loan, at cost | 876 5 0 | | |
| | £1,000 3% Savings Bonds, at cost | 970 0 0 | | |
| | (*Market Value 31.12.53, £1,718*) | | 1,846 5 0 | |
| | £200 3½% Defence Bonds, at cost | | 200 0 0 | |
| | Cash at Bank | | 29 5 0 | |
| 2,121 | | | | 2,075 10 0 |
| £2,121 | | | | £2,200 9 6 |

## Education

Courses for the City and Guilds of London Institute examinations in illuminating engineering were held in London and in other cities during the year. Results of the examinations held in May showed 30 successes in the Intermediate Grade, 14 in the Final Grade (Papers 1 and 2) and 23 in the Final Grade (Papers 1 and 3). Owing to lack of support many Centres which endeavoured to organise courses were unable to do so; more students, however, appear to be making use of correspondence courses and a course for the final examination is now available.

## Other Activities

Mention was made in the last report of a new edition of the I.E.S. Code which it was hoped would be published during the year under review. The alterations and amendments which are being made are rather matters of presentation than matters of fundamental principle. It is hoped to include further information on glare as a result of work which has been done in recent years both in this country and overseas; this section of the Code has given rise to considerable discussion on the Code Committee which, though causing delay in publication, will no doubt lead to a helpful elucidation of the problem which will be of great value to those who use the Code. (It is some comfort to know that other countries are faced with the same difficulties in including recommendations for controlling glare in their lighting codes.)

Arrangements were begun during the year for the next summer meeting, which is to be held at Southport from May 18-21. The organisation of these meetings in the past has been such that the programme has always moved smoothly from one event to another without any apparent effort. That this is so is due to the work of the summer meeting committee which begins work on the next meeting almost as soon as each one finishes. The task of arranging the papers and the programme to appeal to as many members as possible is not an easy one. The 1954 meeting had already been given considerable publicity before the end of the year under review, and it is encouraging to hear that many more visitors from overseas have already indicated their intention of being present at Southport.

## I.E.S. Representatives on Outside Committees

(As at December 31, 1953)

| | |
|---|---|
| National Illumination Committee ... | Dr. J. N. Aldington, Mr. G. G. Baines, Mr. J. G. Holmes, Mr. L. H. McDermott, Mr. J. M. Waldram |
| Council for Codes of Practice ... | Mr. H. C. Weston |
| Parliamentary and Scientific Committee ... | Mr. H. C. Weston |
| City and Guilds of London Institute Advisory Committee on Illuminating Engineering ... | Mr. W. R. Stevens |
| Committees of the British Standards Institution: | |
| Electric Lamps and Lampholders for Aircraft ... | Mr. A. G. Penny |
| British National Committee of the I.E.C. ... | Dr. J. N. Aldington |
| Cinematograph Industry Standards Committee ... | Mr. H. C. Weston |
| Cinematograph Electrical Equipment ... | Mr. S. S. Beggs |
| Cinema Studio Lighting, Lamps and Fittings ... | Mr. S. S. Beggs |
| Cinematograph Carbon-Arc Equipment ... | Dr. F. S. Hawkins |
| Ripple Content in Electricity Supply to Studio Equipment ... | Dr. F. S. Hawkins |
| Auditorium and Safety Lighting for Cinemas and Theatres ... | Mr. S. S. Beggs |
| Auditorium Lighting (Drafting) ... | Mr. S. S. Beggs |
| Safety Signs for Cinemas and Theatres ... | Mr. S. S. Beggs |
| Stage Electrical Equipment ... | Mr. E. E. Faraday |

| | |
|---|---|
| Code of Practice Committee on Street Lighting ... | Mr. E. Stroud<br>Mr. J. M. Waldram |
| Code of Practice Committee on Street Lighting (Drafting) | Mr. E. Stroud |
| Flameproof Fittings for Lighting Purposes ... | Mr. H. S. Allpress |
| Graphical Symbols for Interior Electrical Installations ... | Mr. W. T. F. Souter |
| Low Pressure Gas Mantles ... | Mr. F. C. Smith |
| Metal Windows ... | Mr. G. F. Cole |
| Illumination Industry Standards Committee ... | Mr. J. M. Waldram, Mr. J. G. Holmes, Mr. L. H. McDermott, Dr. J. N. Aldington, Mr. G. Grenfell Baines |
| Portable Photometers ... | Mr. J. G. Holmes |
| Nomenclature for Illumination ... | Mr. R. O. Ackerley, Mr. G. F. Cole |
| Lightings Fittings ... | Mr. W. T. F. Souter, Mr. A. W. Jervis |
| Neck Dimensions ... | Mr. E. Stroud |
| Diffusing Materials ... | Dr. J. W. T. Walsh |
| Fittings for Double-capped Tubular Lamps ... | Mr. V. F. Beuttell |
| Study Lamp ... | Dr. T. Angus, Mr. George Smith |
| Street Lighting ... | Mr. E. Stroud, Mr. J. M. Waldram |
| Electric Lamps ... | Mr. W. T. F. Souter |
| Electric Lamps for Navigation Purposes ... | Mr. G. F. Cole |
| Discharge Lamps ... | Mr. A. G. Penny |
| Photometric Integrators ... | Mr. G. T. Winch |
| Artificial Daylight Units ... | Prof. W. D. Wright |
| Coloured Signal Glasses ... | Mr. J. G. Holmes |
| Bullseye Lenses ... | Mr. G. F. Cole |
| Electric Signs ... | Mr. G. F. Cole |
| Road Traffic Control Signals ... | Dr. J. N. Aldington |
| Ultra-Violet Light ... | Mr. A. G. Penny |
| Surface Colours for Signalling Purposes ... | Mr. J. G. Holmes |
| Colour Terminology ... | Mr. G. T. Winch |
| Photographic Electronic Flash Equipment ... | Mr. H. W. Cumming |
| Construction of Road Traffic Signs ... | Mr. F. C. Smith |
| Illumination of Signs ... | Mr. F. C. Smith, Mr. M. E. Pyser |
| Photographic Industry Standards Committee ... | Mr. H. K. Bourne |
| Equipment for Head Protection against Radiation ... | Mr. H. C. Weston |

### Conclusion

An active Society inevitably throws much work on its permanent secretary and staff; and if the staff is small, overloads, such as that due to a summer meeting, or the absence of one of its members, are difficult to even out. Mr. Cole and his staff ensure that such stresses and strains are seldom apparent, and the Council thanks them sincerely for their work in the past year.

W. R. STEVENS (*President*).
H. C. WESTON (*Hon. Secretary*).

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## Annual General Meeting

The annual general meeting of the Illuminating Engineering Society will be held at the Cambridge Hall, Lord Street, Southport, at 4 p.m. on Friday, May 21, when the Report of the Council and the accounts for the year ended December 31, 1953, will be submitted.

# Additions to the List of Members

The following applicants have been duly elected by the Council to membership in the Society and their names have been added to the list of members:—

SUSTAINING MEMBERS:—

Engineering Service Installations, Ltd., .....*Representative*: K. R. Gibbins
258, Gray's Inn Road, LONDON, W.C.1.

CORPORATE MEMBERS:—

Alexander, James .....105, Ashcroft Drive, GLASGOW, S.4.
Alston, G. H. P. .....72, Malford Grove, Snaresbrook, LONDON. E.18.
Anthony, N. T. .....Siemens House, 8, Albion Street, LEICESTER.
Bowen, F. A. .....36, Berkeley Avenue, Greenford, MIDDLESEX.
Calvert, T. M. ....."Rossmore," Cumberland Park, Dundonald, BELFAST, N.I.
Chambers, R. H. .....242, Walsall Road, Perry Barr, BIRMINGHAM, 22B.
Cooney, M. .....481, Beechdale Road, Aspley, NOTTINGHAM.
Davies, A. G. .....41a, Bryn Road, Brynmill, SWANSEA.
Downing, G. S. .....158, Putney Road, Handsworth, BIRMINGHAM.
Edwards, W. A. .....30, Elm Way, Worcester Park, SURREY.
Francis, D. B. .....3, Penyrheol Drive, Llanelly, CARMS.
Franklin, L. G. .....29, Fitzroy Square, LONDON, W.1.
Hill, D. A. .....519, J.B.S. Building, Commissioner Street, JOHANNESBURG, SOUTH AFRICA.
Hogan, J. W. .....8, Rothbury Gardens, Lawnswood, LEEDS, 6.
Holmes, E. ....."Nan Tan," Walkers Lane, LEEDS, 12.
Johns, B. .....c/o Metropolitan-Vickers Electrical Co., 22, Victoria Street, BRISTOL, 1.
Knutton, A. B. .....85, Victoria Road, LEEDS, 6.
Krugel, S. W. .....Deans Court, St. Andrews, Fifeshire, SCOTLAND.
Liebenberg, J. L. .....25, Sunflower Road, Primrose, Germiston, Transvaal, SOUTH AFRICA.
Mallalieu, B. .....Dicken Green Farm, Queensway, ROCHDALE.
Marryat, R. A. .....4b, Hatton Garden, LONDON, E.C.1.
Marsden, E. ....."Deva," Buxton Road, High Lane, via Stockport, CHESHIRE.
Martin, E. F. .....The Franco-British Electrical Co., Ltd., 180, Corporation Street, BIRMINGHAM, 4.
May, E. W. .....38b, Pitshanger Lane, Ealing, LONDON, W.5.
Merricks, B. F. ....."Kampala," 49, Winden Avenue, Chichester, SUSSEX.
Nash, D. A. D. .....Wayside Cottage, Sanderson's Wynd, Tranent, East Lothian, SCOTLAND.
Parsons, R. V. .....6, Estcourt Close, GLOUCESTER.
Pennie, G. A. .....10, Saltburn Road, Springwell, Sunderland, Co. DURHAM.
Plant, T. A. .....2, Kingsley Street, Battersea, LONDON, S.W.11.
Pott, A. .....Hillcote, Wheathampstead Road, Harpenden, HERTS.
Price, W. A. .....92, Kenmore Avenue, Kenton, MIDDLESEX.
Sanders, R. H. .....20, Raglan Road, Sketty, SWANSEA.
Szahidewicz, J. .....97, Warwick Road, LONDON, S.W.5.
Terry, R. R. .....27, Sunlight Street, LIVERPOOL, 6.

OVERSEAS MEMBER:—

Piro, R. A. .....c/o Osram A/S, Tollbugt 32, Oslo, NORWAY.

STUDENT MEMBERS:—

Cubitt, B. F. .....5, University Crescent, Gorleston, GT. YARMOUTH.
Pick, J. .....70, Albany Road, Southtown, GT. YARMOUTH.

TRANSFER TO CORPORATE MEMBERSHIP:—

Chasey, S. J. .....Cryselco, Ltd., Kempston Works, BEDFORD.

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